APPENDIX 1

Technical Memorandum on Evaluation on 2018 Proposed SWRP NPDES Discharge Permit.
Jacobs Engineering Group Inc. June 22, 2018.

JACOBS

Memorandum

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Subject	**Evaluation of 2018 Proposed SWRP NPDES Discharge Permit**
Attention	John Stomp/Water Authority
From	Jacobs
Date	June 22, 2018
Copies to	Hazen and Sawyer

1. Introduction

The Albuquerque Bernalillo County Water Utility Authority (Water Authority) discharges treated effluent from the Southside Water Reclamation Plant (SWRP) to the Rio Grande. The current National Pollutant Discharge Elimination System (NPDES) permit for the SWRP ("2012 permit") is being renewed, with a draft permit renewal issued on February 24, 2018 ("2018 proposed permit"). Several effluent water quality limits have been proposed in the 2018 draft permit, including limits for total dissolved solids (TDS), chlorides, sulfates, and mercury. The Water Authority requested that Jacobs evaluate the assumptions used to develop the new limits.

The 2018 draft permit's limits are based on revised interpretations by the U.S. Environmental Protection Agency (EPA) of 1) downstream water quality limitations, as described in the Pueblo of Isleta Surface Water Quality Standards (PIWQS), and 2) applicable low flow conditions in the Rio Grande. This technical memorandum (TM) summarizes the assumptions used in the revised effluent limits and how they changed from previous assumptions, followed by a section putting one of these assumptions, the low flow rate in the Rio Grande, into context of historical flows and operations.

2. NPDES Permitting

Effluent water quality limits for the 2005 permit, the 2012 permit and the 2018 draft permit are set based on a downstream water quality standard being met under specified critical low flow conditions in the Rio Grande. The calculation is currently based on flow rate of the Rio Grande at Central Avenue and the anticipated concentration of both the effluent (at design capacity) and the Rio Grande (under low-flow conditions). The low flow assumptions determine the volume of water that is available for mixing with the effluent discharge. The water quality standard sets a maximum concentration for the mixed streams and therefore for the effluent. The biggest drivers for effluent limits, then, are a) low flow assumptions, and b) downstream water quality standards.

Two sets of standards are used and referenced in the 2005 permit[1], 2012 permit and the 2018 draft permit: New Mexico State Standards for Interstate and Intrastate Surface Waters (NMWQS) and PIWQS. Limits are based on the more stringent of NMWQS and PIWQS. For TDS, chlorides, sulfates, and

[1] The 2005 permit also references the 1992 PIWQS.

mercury limits used in the 2018 draft permit, EPA's interpretation of PIWQS is more stringent than NMWQS, and is therefore the relevant standard. PIWQS were adopted in 1992 and amended in 2002[2], and have not changed between the 2005 permit and the 2018 draft permit. However, EPA's interpretation of PIWQS, both in terms of low flow assumptions and downstream water quality standards, has changed in each of the issued permits and 2018 draft permit. This change in interpretation has led to the new proposed limits for TDS, chlorides, sulfates, and mercury.

This section summarizes EPA's revised interpretation of low flow conditions and downstream water quality standards. Assumptions of upstream Rio Grande water quality could also affect the limits; however, Jacobs did not review assumptions of background concentrations in the Rio Grande.

2.1 Flow Rate

For the 2005 and 2012 permits, effluent discharge limits were based on critical low flows of the Rio Grande at Central Avenue. For the 2005 permit, effluent discharge limits for some constituents were also conditioned seasonally recognizing the complex nature of river operations.

> *"EPA has determined that site-specific conditions present in the City of Albuquerque permit do warrant issuance of a tiered limits approach. Specific circumstances are the highly modified nature of the Rio Grande above the effluent discharge point including the segregation of irrigation return flows to the irrigation canals creating an irrigation season deficit for flows to the river ..."*

A critical low flow of "0" cfs was established for the PIWQS and the lowest four-day average flow rate expected to occur once every three years ("4Q3") in the Rio Grande was established for NMWQS. The 4Q3 was reported by EPA for the respective permits to be 68 and 81 cfs[3] (Table 1). For constituents with year-round limitations (e.g. mercury), the effluent discharge limits associated with the critical low flow of "0" cfs were applied when the 4-day average daily-minimum low flow (Qs4D) was less than 53.7 cfs. For Qs4D flows greater than 53.7 cfs, a greater discharge limit was established. For constituents with seasonally variable limitations (e.g. Ammonia), effluent discharge limits also varied by Qs4D flow criterion that varied seasonally with generally a 53.7 cfs breakpoint from July through October and a 283 cfs breakpoint from November through June.

The 2012 permit removed seasonal limits and indicated that the Qs4D was not a valid approach.

> *"The WQS provides the allowable permit requirements shown above and the Qs4D does not meet them. Establishing permit limits on a rolling 4-day average is not consistent with the WQS."*

For the 2018 draft permit, EPA retained the 4Q3 critical flow for NMWQS, and updated it to 143 cfs based on flow data from 1996 to 2016. However, for the 2018 draft permit, EPA reinterpreted low flow

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[2] https://www.epa.gov/wqs-tech/water-quality-standards-regulations-pueblo-isleta

[3] Jacobs did not verify the 4Q3 value of 68 cfs or 81 cfs used by EPA in the 2005 and 2012 permits, respectively.

assumptions for PIWQS, and used 53[4] cfs, which is the lowest observed single day average flow rate from September 1997 to September 2017. The new interpretation is based on PIWQS Section I.H: "Criteria specific to a designated use shall be protected at all times and at all flow rates." Note that this language did not change from the 2005 or 2012 permits; only EPA's interpretation of this language changed. Jacobs evaluated flow data and could reproduce both PIWQS and NMWQS values used in the 2018 draft permit.

Table 1: Rio Grande Low Flow Assumptions

Permit and Standard	Low Flow (cfs)	Basis
2005 Permit, PIWQS	0 / 53.7[5]/ 283	Historical low/ Irrigation (Qs4D[6]) / Non-irrigation
2005 Permit, NMWQS	68	4Q3: lowest four-day average flow rate expected to occur once every three years
2012 permit, PIWQS and NMWQS	0 / 81	Previous permit limitations/ 4Q3: lowest four-day average flow rate expected to occur once every three years
2018 draft permit, EPA new interpretation of PIWQS	53	Lowest 20-year historical observed flow rate, 1997-2017
2018 draft permit, NMWQS	143	4Q3: lowest four-day average flow rate expected to occur once every three years, based on 1996-2016 data

2.2 Water Quality Standards

New limits for mercury, TDS, chlorides, and sulfates in the 2018 draft permit appear to be based on a revised interpretation by EPA of in-stream water quality standards. This section summarizes the changes to the interpretation of standards.

For mercury, the 2012 permit did not revise the previous permit's effluent limit (EPA, 2011; Fact Sheet, page 15). The 2005 permit's effluent limits were based on a PIWQS criterion of 0.012 ug/L for chronic exposure of aquatic life (Table 2). The 2018 draft permit uses a considerably more stringent criterion of 0.0011 ug/L, based on PIWQS Section IV.I (EPA, 2018; Fact Sheet page 10) which summarizes limits

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[4] It should be noted that in the 2018 fact sheet, pages 10-11, the critical flow rate is described as "the 4Q3 flow rate, 53 cfs." This annotation is incorrect, as 53 cfs is not the 4Q3 flow rate. 53 cfs is the lowest single day flow in a 20-year period; 4Q3 is 143 cfs. Jacobs confirmed that the effluent limit calculations are based on 53 cfs, not 143 cfs.

[5] Note that the 2005 permit mistakenly labels this value as 53.7 "MGD" in several locations.

[6] Qs4D was used to define limits by flow and was defined as a 4-day average low flow. The 4-day average low flow was calculated as the average of the minimum flow on each of 4 consecutive days

based on wildlife usage. Note that the PIWQS did not change from 2012 to 2018; only EPA's interpretation of the limits changed. Wildlife usage, in PIWQS, is defined as follows:

> *Wildlife Usage means the use of the surface waters of the PUEBLO OF ISLETA by nondomesticated plants and animals for direct water consumption, foraging or where the waters and their associated wetland/riparian areas are used for habitat, cover and/or propagation. Waters designated for wildlife usage shall not contain any substance at concentrations which would be deleterious to any nondomesticated plant or animal or that could bioaccumulate or biomagnify to such deleterious levels.*

The 2005 and 2012 permits did not include analysis of TDS, chlorides, and sulfates. In the 2018 draft permit, EPA added downstream water quality standards for TDS, chlorides, and sulfates based on EPA's interpretation of PIWQS. As stated previously, PIWQS did not change since the 2012 permit; only EPA's interpretation changed. Section III.H of PIWQS states:

> *Salinity/Mineral Quality (total dissolved solids, chlorides, and sulfates): Existing mineral quality shall not be altered by municipal, industrial, and instream activities, or other waste discharges so as to interfere with the designated or attainable uses for a water body. An increase of more than 1/3 over naturally occurring levels shall not be permitted.*

Table 2 summarizes the numerical limits based on EPA's interpretation of PIWQS standards, as compared with those from NMWQS standards.

Table 2: Applicable Water Quality Criteria, PIWQS vs NMWQS for SWRP Discharge.

Standard	Mercury (ug/L)	TDS (mg/L)	Chlorides (mg/L)	Sulfates (mg/L)
2005 Permit	0.012[1]	1,500 (NM WQS) at flows above 100 cfs	250 (NM WQS) at flows above 100 cfs	500 (NM WQS) at flows above 100 cfs
2012 permit	0.012[1]	1,500 (NM WQS) at flows above 100 cfs	250 (NM WQS) at flows above 100 cfs	500 (NM WQS) at flows above 100 cfs
2018 draft permit, PIWQS	0.0011	692 [2](no more than 1/3 increase of the background concentration)	147 [2] (no more than 1/3 increase of the background concentration)	160 [2] (no more than 1/3 increase of the background concentration)
2018 draft permit, NMWQS	0.77	1500 at flows above 100 cfs	250 at flows above 100 cfs	500 at flows above 100 cfs

[1] Mercury limits of 0.012 ug/L were based on PIWQS criterion for chronic exposure of aquatic life.

[2] The basis for the calculation of the proposed limits for TDS, Chlorides and Sulfates is not clear as the terms are not define

2.3 Effect of Standards and Assumptions on Effluent Limits

The combined effect of EPA's revised interpretation of low flow assumptions and downstream water quality results in substantially different effluent permit limits in the 2018 draft permit compared with the 2005 or 2012 permits. Table 3 presents 30-day average discharge limits used in the 2005 and 2012 permits compared with those in the 2018 draft permit.

Table 3: Calculated 30-day Average Effluent Concentration Limits, 2005 permit, 2012 permit, and 2018 draft permit

Permit	Low Flow Assumption	Downstream Criterion, Mercury (ug/L)	30-day Average Effluent Limit, Mercury (ug/L)	Downstream Criteria, TDS, Chlorides, Sulfates	Effluent Limit, TDS (mg/L)	Effluent Limit, Chlorides (mg/L)	Effluent Limit, Sulfates (mg/L)
2005	0 / 53.7 (irrigation flow)	0.012	0.008/0.012	none / 1500, 250, 500 (NM WQS)	n/a	n/a	n/a
2012	0	0.012	0.008	none / 1500, 250, 500 (NM WQS)	n/a	n/a	n/a
2018 draft	53 cfs (single lowest day; EPA interpretation of PIWQS used in draft 2018 permit)	0.0011 (2018 EPA interpretation of PIWQS)	0.0016	1/3 increase	770	164	178

2.4 Other Relevant NPDES Permits

Other significant NPDES dischargers in the vicinity of the SWRP include City of Rio Rancho WWTP (NM0027987), the Rio Bravo Generating Station (NM0030376), and the South Diversion Channel of the Middle Rio Grande Watershed Based Municipal Separate Storm Sewer System General Permit (NMR04A000). None[7] of these facilities included water quality limitations wholly consistent with SWRP's or consistent consideration of either flow or PIWQS standards. Of particular note, the South Diversion Channel discharges below the SWRP discharge, includes the Rio Bravo Generating Station discharge and is closer to the Isleta Pueblo boundary than the SWRP's discharge.

3. Evaluation of Flow and Operations

As summarized in the preceding section, effluent concentrations limits are dependent on the assumption of low-flow rate used in the calculations. This section summarizes historical hydrology and river operations, in an attempt to better characterize the likelihood of the PIWQS low-flow conditions occurring again in the future.

[7] Rio Rancho's NPDES Permit includes discharge limits on TDS.

The SWRP discharge location is shown in Figure 1, along with major diversion locations, return flow locations, and gaging stations. Low flow values for both PIWQS and NMWQS are based on historical flows at the Central gage (USGS gage 08330000; "Rio Grande at Albuquerque"), located upstream from the SWRP discharge. Flow at Central is heavily influenced by diversions upstream of Central, by the Middle Rio Grande Conservation District (MRGCD). It is common for there to be several months in the late summer during which flows at Central are less than half of the upstream flows at San Felipe.

3.1 Typical Operations

Under "normal" or typical operations during the irrigation season, native Rio Grande or San Juan-Chama (SJC) water flows through Cochiti Reservoir south to San Felipe. Some portion of the flow is diverted at Angostura for irrigation purposes and is conveyed though the MRGCD's network of canals and drains. Water not diverted at Angostura continues to flow south past the Rio Grande gages at Alameda and Paseo del Norte.

When the Water Authority surface water diversion is in operation, San Juan-Chama water is released upstream of Cochiti and conveyed along with native Rio Grande water to the diversion point near Alameda Boulevard.

Through this reach of the Rio Grande, water also seeps from the River banks and bed and is generally captured in the riverside drains. Water captured in the drains co-mingles with the water diverted at Angostura and tail water from irrigation operations and is either returned to the river via waste ways or is conveyed further south to MRGCD's Belen Division below Isleta.

> *"MRGCD return flows are also an important part of the irrigation system and river operations. District management of return flows provides regularly wetted conditions downstream from the outlets of wasteways. MRGCD return flows can strategically release water to key reaches during low-flow or drying periods in the Albuquerque or Isleta Reaches..." (Reclamation, 2015 Joint Biological Opinion, p. 170)*

Water in the Rio Grande flows past the gage at Central Avenue Bridge and is subsequently augmented with flows from the Water Authority's SWRP and comparable or greater flows from the Atrisco and Albuquerque Drain outfalls.

During rainfall events, the River can also receive significant flow from tributaries and arroyos like the Jemez river, the Calabacillas, and Tijeras Arroyos as well as from drainage infrastructure like the North and South Diversion Channels. Many of these are ungagged or data are not readily available, further complicating the water balance.

Once past the greater Albuquerque area, MRGCD diversions are made at Isleta[8] for irrigation purposes. Water remaining in the river continues to flow downstream. Table 4 presents a snapshot of "normal" operations.

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[8] Note that the Isleta Diversion as located on Figure 1 is gaged with five (5) meters that reflect canals on both the east and west side of the river. These meters are noted on Tables 4 and 5, the sum of which is the entire Isleta Diversion.

Table 4: Rio Grande Flow Balance on June 8, 2013

Description		Inflow	River	Outflow
SILCN - Sili Main Canal				53
COCCN - Cochiti East Side Main Canal				93
RG Below Cochiti			896	
Galisteo Arroyo		?		
Santo Domingo WS Drain		?		
Santo Domingo ES		?		
SILWW - SILI MAIN WASTEWAY		9		
RG San Felipe			978	
ANGDV - ANGOSTURA DIVERSION		?		117
Jemez River Inflow		?		
Rio Rancho WW		?		
SANWW - SANDIA LAKES WASTEWAY		0		
UCRDR - UPPER CORRALES DRAIN		16		
RG Alameda Bridge			710	
ABCWUA Diversion				130
RG Alameda			573	
HAYWW - HAYNES WASTEWAY		0		
CORWW - CORRALES WASTEWAY		0		
LCRDR - LOWER CORRALES DRAIN		1		
CENWW - CENTRAL AVENUE WASTEWAY		6		
Albuquerque Riverside Drain		?		
RG Central			529	
ABCWUA Return flow		79		
South Diversion Channel		?		
RG Isleta Lakes			520	
ATRDR - ATRISCO DRAIN OUTFALL		24		
ARSDR - ALBUQUERQUE DRAIN OUTFALL		54		
Isleta Diversion	BELCN - BELEN HIGH LINE CANAL HEADING			393
	PERCN -			
	CHICN -			
	CHACN -			
	CACCN -			
ALJWW - ALEJANDRO WASTEWAY		0		
240WW - 240 FEEDER WASTEWAY		0		
RG Bosque Farms			196	

Notes: Bold items are ABCWUA facilities. The "?" refer to inflows that are either ungagged or that the data were not available for this analysis.

3.2 Low flow Operations

During low flow conditions, an emphasis is placed on efficiently conveying water downstream – meeting Prior and Paramount obligations[9] and for compliance with any applicable Biological Opinion. For each case, water is most efficiently conveyed downstream via the MRGCD's canal network, as more water is lost to evaporation and seepage in the broad, sandy channel of the River than in the deep narrow canals.

> *"During shortage operations, diversions at Angostura typically are increased to allow the limited river flow to be used as efficiently as possible and ensure that water is delivered to the Six MRG Pueblos, and to non-Indian irrigators as well if sufficient water is available..." (Reclamation, 2015 Joint Biological Opinion, p. 93)*

Diversions at Angostura and water that seeps from the Rio Grande to the riverside drains is conveyed via MRGCD's canal network downstream. This water is not evident in the USGS gage measurements at Central Avenue Bridge but does flow into the Belen Division and mix with water diverted at Isleta. Likewise, during low flow operations, the Isleta Diversion typically takes the vast majority of remaining Rio Grande flow resulting in drying below the Isleta Diversion. In fact, in 2013, Reclamation allowed the river to dry in the Isleta Reach.

> *"Under this plan, Reclamation began an early reduction of Supplemental Water releases (with river drying to begin on June 1 instead of June 15). In compliance with the 2003 BiOp, the Rio Grande was allowed to dry in isolated locations within the Isleta Reach..." (Reclamation, 2014. Calendar Year 2013 Report to the Rio Grande Compact Commission. March.)*

The Biological Opinion further notes that Isleta Diversion takes up to 100 percent of the flow of the Rio Grande in both the spring runoff and fall low flow periods as part of normal operations (see an excerpt from the 2015 Biological Opinion describing Angostura and Isleta Diversion Operations in Attachment 1). Figure 2 presents the key river features from the SWRP to Bosque Farms. Likewise, as shown in Figure 3, the 2015 Biological Assessment acknowledges routine historical drying with upwards of 50 miles of river drying in the Isleta reach. (Reclamation. 2015. *Joint Biological Assessment, Part I – Action Area and Species Related Information*. August)

Clearly in these circumstances, the PIWQS standards are not intended to be "protective of wildlife" downstream of Isleta Diversion as normal operations dictate river drying. Furthermore, if the standard is intended to be protective of aquatic life for water diverted for use on the Pueblo, the gaged flow at Central is not representative of the total flow available to the Belen Division of the MRGCD. This flow includes both water diverted at Isleta and water passed via the irrigation network from the Albuquerque Division to the Belen Division.

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[9] MRGCD is obligated by Statute and Permit to provide water for tribal Prior and Paramount Operations. This includes reserving storage for continued operations during drought conditions.

3.3 September 8, 2013

On the low flow day in question, 112 cfs was diverted at Angostura, almost half of the flow of the River. Additional losses occurred through seepage from the Rio Grande to the riverside drains, which comingle with water diverted at Angostura and is either passed through the irrigation system or returned to the River. Table 5 presents available data for September 8, 2013. These data show the noted 112 cfs diversion at Angostura and the 53 cfs measurement[10] at Central. Note also that 92 cfs of water is returned to the River below Isleta Lakes and above the Isleta Diversion. This is water that is available downstream of Central Avenue that was not recorded at the Central Avenue gage. Also note that approximately 105 cfs was diverted at Isleta, effectively resulting in drying below the diversion. This diverted water was combined with water passed from the Albuquerque Division via the irrigation system– the remaining drain flow and original diversion at Angostura. Figure 4 shows a pipe diagram of the Rio Grande by river location for September 8, 2013. Figure 5 shows a simplified version with only the major diversions and discharges.

[10] Note that the USGS gage at Central Avenue is rated as "excellent" which translates to plus or minus 15 percent. Due to the potential for braiding and channeling, the accuracy is reduced at lower flows. The reported 53 cfs on September 8th is an *estimated* value rather than a direct measurement.

Table 5: Rio Grande Flow Balance on September 8, 2013

Description		Inflow	River	Outflow
SILCN - Sili Main Canal				44
COCCN - Cochiti East Side Main Canal				78
RG Below Cochiti			231	
Galisteo Arroyo		?		
Santo Domingo WS Drain		?		
Santo Domingo ES		?		
SILWW - SILI MAIN WASTEWAY		1		
RG San Felipe			299	
ANGDV - ANGOSTURA DIVERSION				112
Jemez River Inflow		?		
Rio Rancho WW		?		
SANWW - SANDIA LAKES WASTEWAY		0		
UCRDR - UPPER CORRALES DRAIN		2		
RG Alameda Bridge			175	
ABCWUA Diversion				0
RG Alameda			136	
HAYWW - HAYNES WASTEWAY		0		
CORWW - CORRALES WASTEWAY		0		
LCRDR - LOWER CORRALES DRAIN		6		
CENWW - CENTRAL AVENUE WASTEWAY		2		
Albuquerque Riverside Drain		?		
RG Central			53	
ABCWUA Return flow		79		
South Diversion Channel		?		
RG Isleta Lakes			50	
ATRDR - ATRISCO DRAIN OUTFALL		18		
ARSDR - ALBUQUERQUE DRAIN OUTFALL		74		
Isleta Diversion	BELCN - BELEN HIGH LINE CANAL HEADING			105
	PERCN -			
	CHICN -			
	CHACN -			
	CACCN -			
ALIWW - ALEJANDRO WASTEWAY		1		
240WW - 240 FEEDER WASTEWAY		42		
RG Bosque Farms			39	

Notes: Bold items are ABCWUA facilities. The "?" refer to inflows that are either ungagged or that the data were not available for this analysis.

3.4 Low Flow Hydrology Over Time

Historical low flows of the Rio Grande at Central are presented in Figure 6. 2013, the year in which the noted daily average low flow of 53 cfs was observed, is the only year that had single-day flows below 100 cfs (during the period 1997-2017). 2004 had the next lowest single day flow, at 104 cfs. In 2013, the lowest 7-day average flow was 91 cfs, and the lowest 14-day average flow was 101 cfs. These statistics suggest that the low flow of 53 cfs was a rare occurrence.

The rarity of this low flow can also be seen in a plot of frequencies of low flows (Figure 7). Over the 20-year period 1997-2017, only 11 days (0.16 percent of days in the 20-year record) had flow less than 100 cfs. All of these days occurred in 2013.

Time-series data of flow in the Rio Grande, along with diversions, are presented in Figure 8. All 11 of the dates with flow at Central less than 100 cfs are included in Figure 8; however, MRGCD's datasets are missing data for 2 full days of these 11 days. The following conclusions can be drawn from Figure 8:

- During all 9 days with flow at Central less than 100 cfs and MRGCD data available, MRGCD was diverting a significant amount of water from the Rio Grande at Angostura
    - On average, MRGCD's Angostura diversions were greater than 100 cfs on those 9 days, and in some cases exceeded 50 percent of flow in the Rio Grande at San Felipe.
- The Water Authority was not diverting water for the Drinking Water Project during any of these low-flow events. The Water Authority was releasing a small amount of water (about 8 cfs) from Abiquiu for diversion at the North I-25 non-potable project (Figure 9). The low flow dates in 2013, including the PIWQS flow rate of 53 cfs, are ***artificially*** low due to MRGCD diversions during low-flow periods.
    - Note that MRGCD released San Juan-Chama water only through July 2 (Figure 9); accordingly, MRGCD's diversions during the low flow periods were of native Rio Grande water only.

To assess potential implications to wildlife downstream (PIWQS mercury standard), Rio Grande flows and diversions downstream of Central were also evaluated (Figure 10). As shown in Figure 1, MRGCD has two drain outfalls just upstream of the Isleta diversion. Available water at Isleta is assumed to be the sum of Rio Grande flow at Isleta Lakes plus the two drain inflows to the Rio Grande. During low flow periods, flow in the Rio Grande at Isleta Lakes (that is, the receiving waters for SWRP discharge) generally makes up less than 50 percent of available water at Isleta (Figure 10). On September 8, the date of the low flow at Central of 53 cfs used by EPA, Rio Grande water (including SWRP discharge) made up only 35 percent of the total water available for diversion at Isleta – meaning that the flow at Central was not representative of the critical low flow used in the exposure calculations.

4. Summary and Conclusions

The following summarizes key points presented in this memorandum:

- Changes to permit limitations for mercury, and proposed effluent limitations for TDS, chlorides, and sulfates are based solely on revised interpretations of PIWQS by EPA, for both downstream water quality criteria and low flow conditions. PIWQS did not change from the 2012 permit to the 2018 draft permit. Had EPA not reinterpreted PIWQS, there would be no need for revised discharge limits, other than to potentially *increase* allowable discharge concentrations based on the 4Q3 low flow rate being greater using more recent data.

- The low flow condition used for the 2018 draft permit is based on the lowest observed single day average flow rate, 53 cfs, which is a new interpretation of PIWQS. The 2012 permit, relying on the same PIWQS, used a critical low flow of 0 cfs and the 4Q3, the lowest four-day average flow rate expected to occur once every three years. The 4Q3 rate used in the 2012 permit was 81 cfs; however, 4Q3 has since increased to 143 cfs.

    - The low flow condition of 53 cfs occurred on September 8, 2013. There were a total of 11 days of flow in the Rio Grande in 2013 that were below 100 cfs. During the period evaluated by EPA, 1997-2017, no other years had flow below 100 cfs.

    - During the low-flow periods of 2013:

        - MRGCD was diverting a significant amount of water from the Angostura Diversion, which exacerbated low flow conditions since MRGCD was not releasing San Juan-Chama water for diversions during the low flow periods.

        - The Water Authority was not diverting water at the Drinking Water Project.

        - A significant amount of MRGCD drain inflow just above the Isleta Diversion resulted in upstream Rio Grande flows, including SWRP discharge, making up as little as 35 percent of available water for diversion at Isleta. Accordingly, EPA's mixing calculation, which represents as little as 35 percent of available water, does not accurately estimate concentrations of water available at the Isleta Diversion during low flow periods.

        - MRGCD diverted about 70 percent of the available water for diversion at Isleta, with downstream Rio Grande flow very low at around 35 to 40 cfs.

- Downstream water quality criterion for mercury used in the 2018 draft permit is 0.0011 ug/L for wildlife usage. The 2012 permit was based on a downstream water quality criterion of 0.012 ug/L for aquatic life. The change was due solely to EPA's reinterpretation of PIWQS.

- Downstream water quality standard for TDS, chlorides, and sulfates in the 2018 draft permit is based on a limit of a 1/3 increase over naturally occurring levels. The 2012 permit does not appear to include analysis of TDS, chlorides, and sulfates. The change was due solely to EPA's reinterpretation of PIWQS.

Figure 1: Location Map

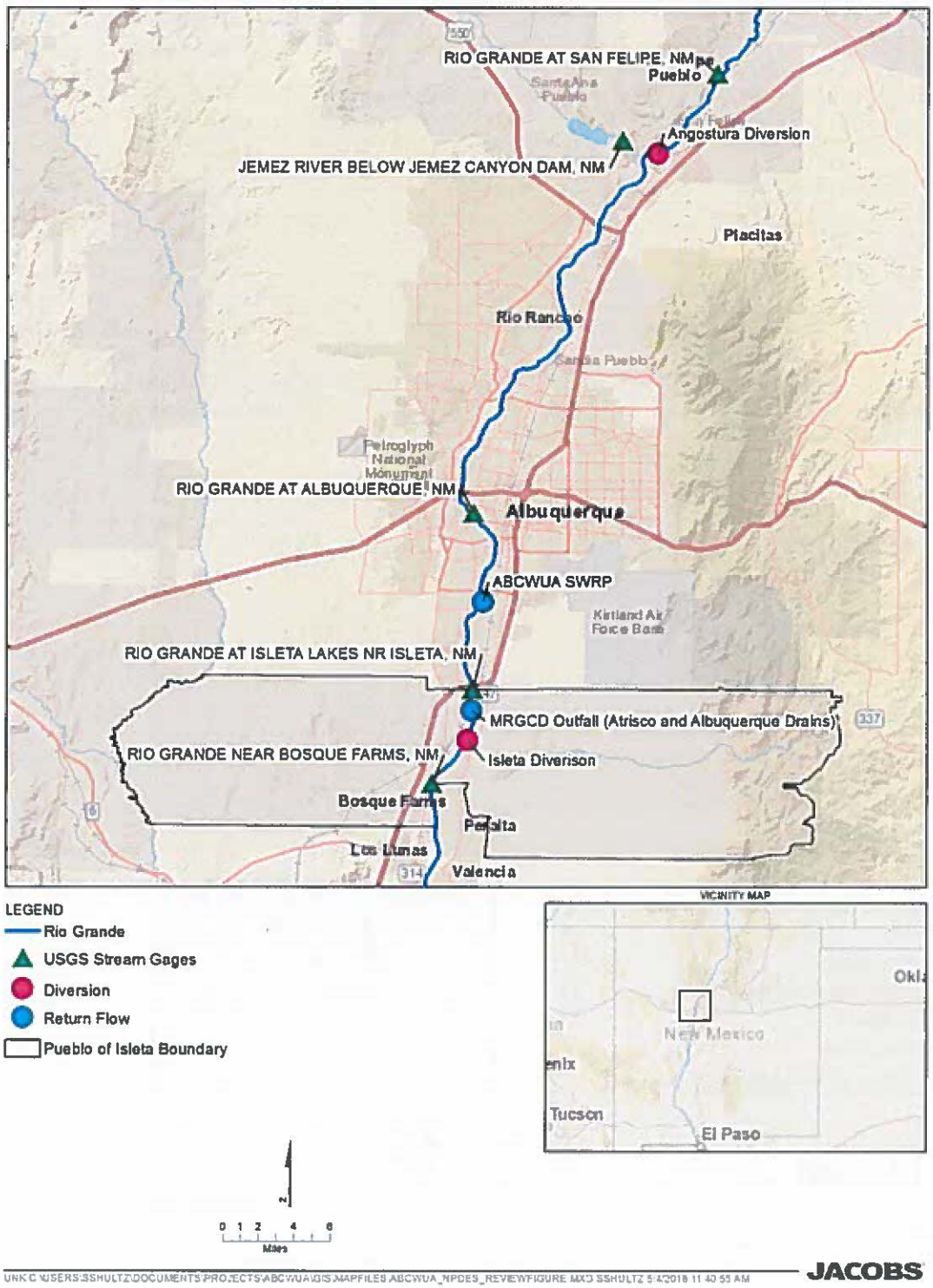


Figure 2: Location Close up of SWRP to Bosque Farms

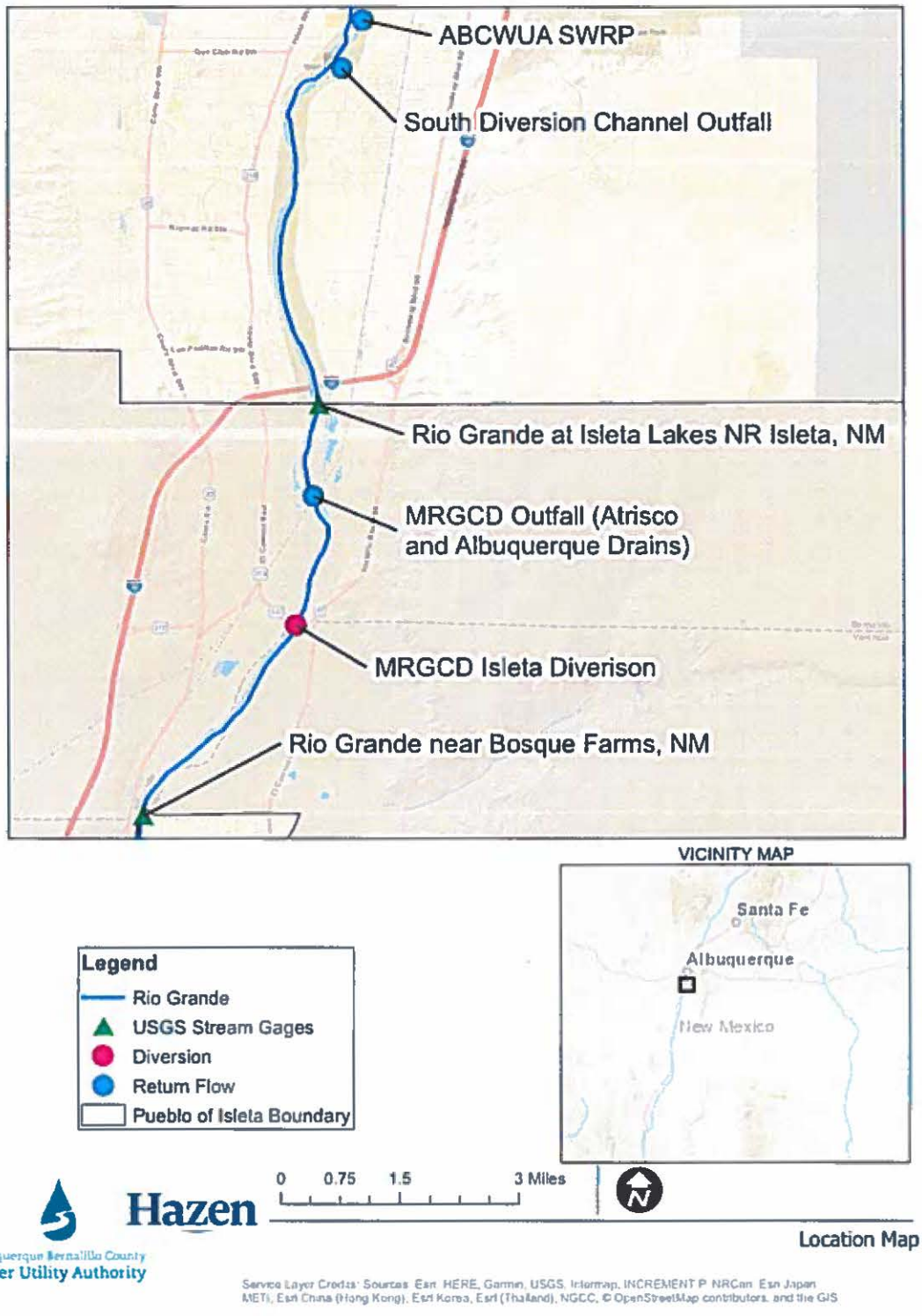
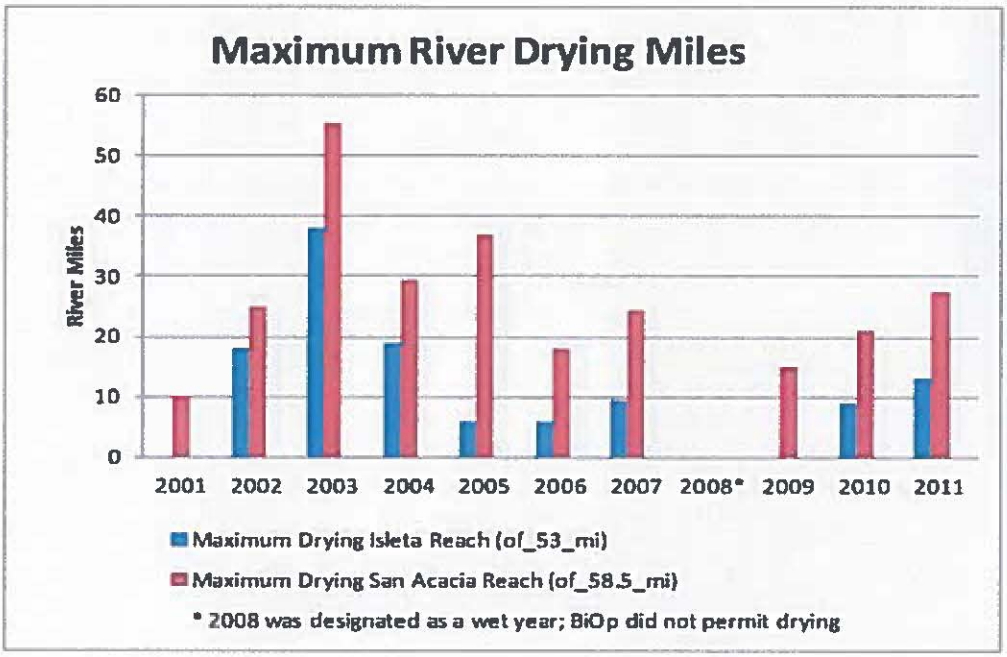


Figure 3: Historical Drying in the Isleta Reach
(from Reclamation, 2015 Biological Assessment)



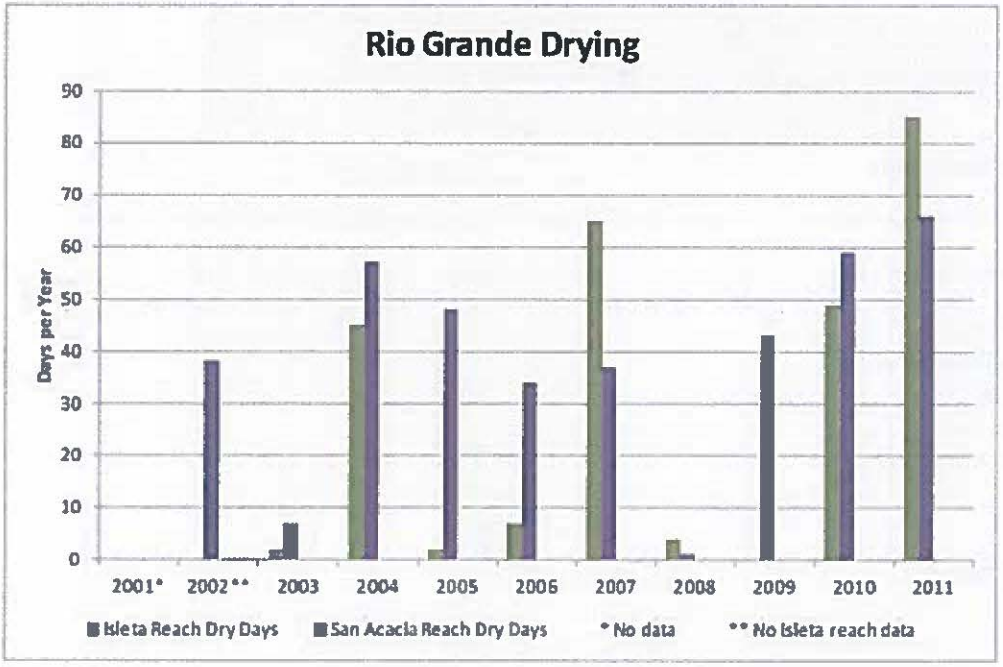


Figure 4: Pipe Diagram of Rio Grande Flow by Location

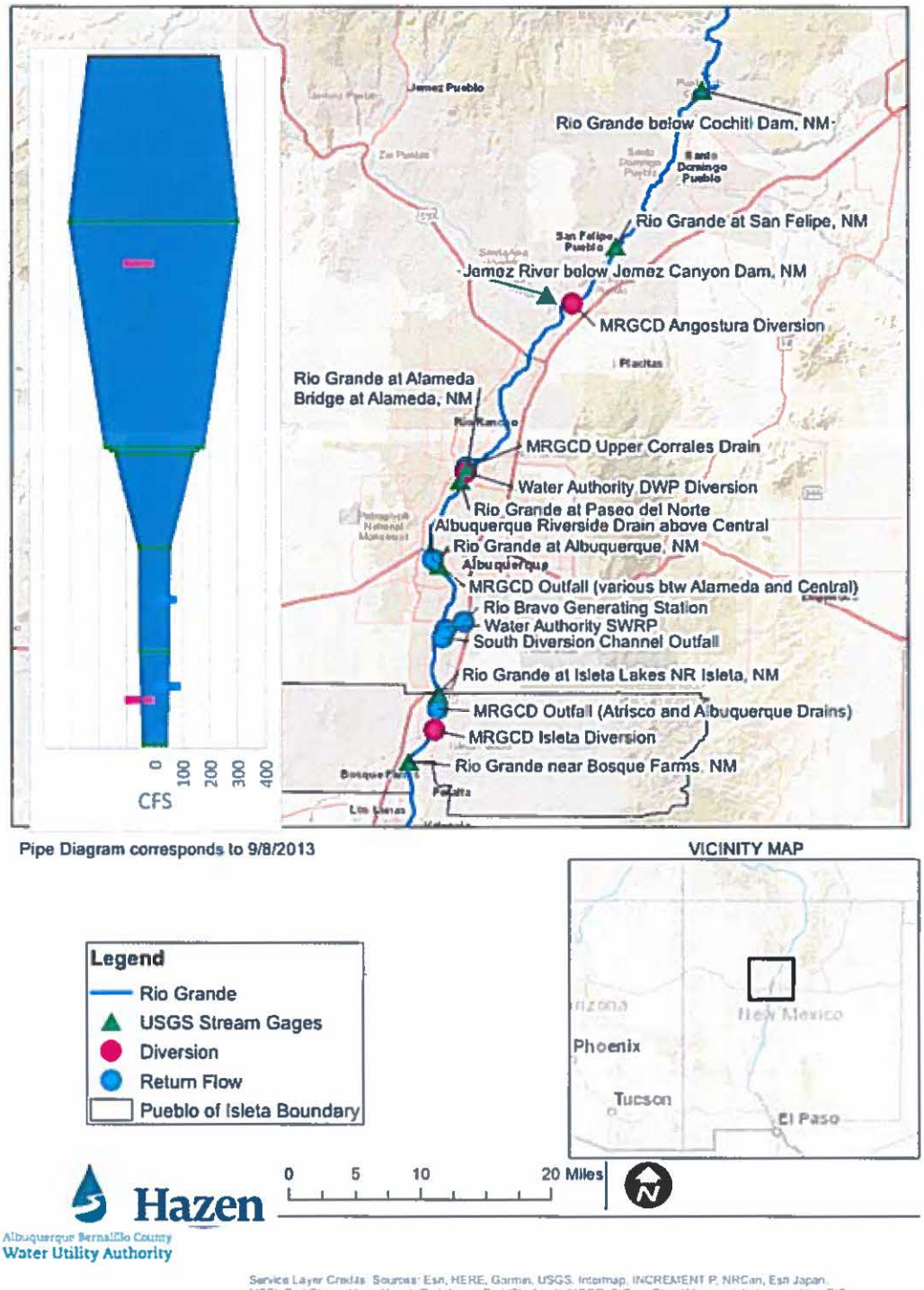


Figure 5: Water Balance September 8, 2013, Rio Grande at Central

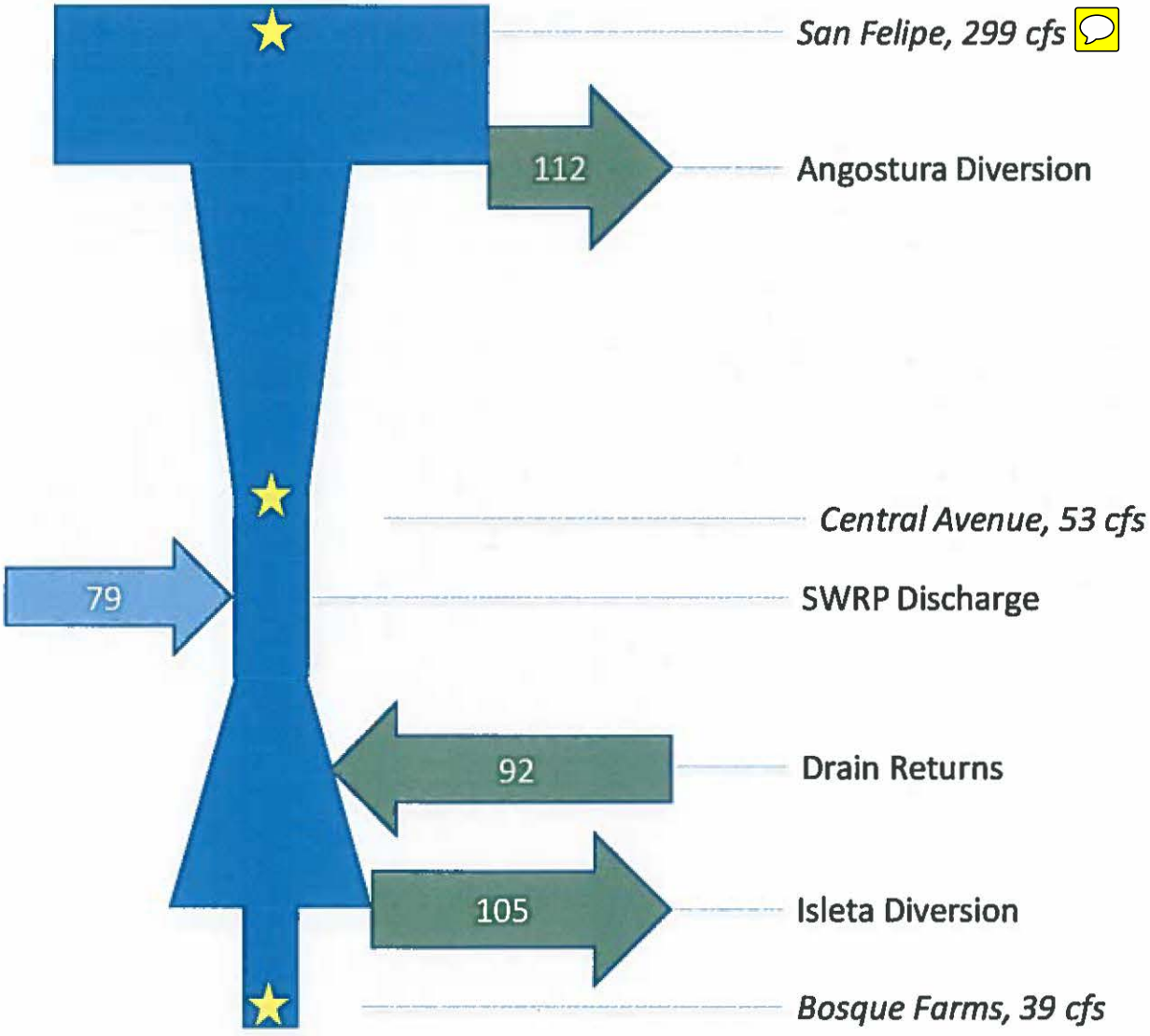


Figure 6: Historical Low Flows, Rio Grande at Central

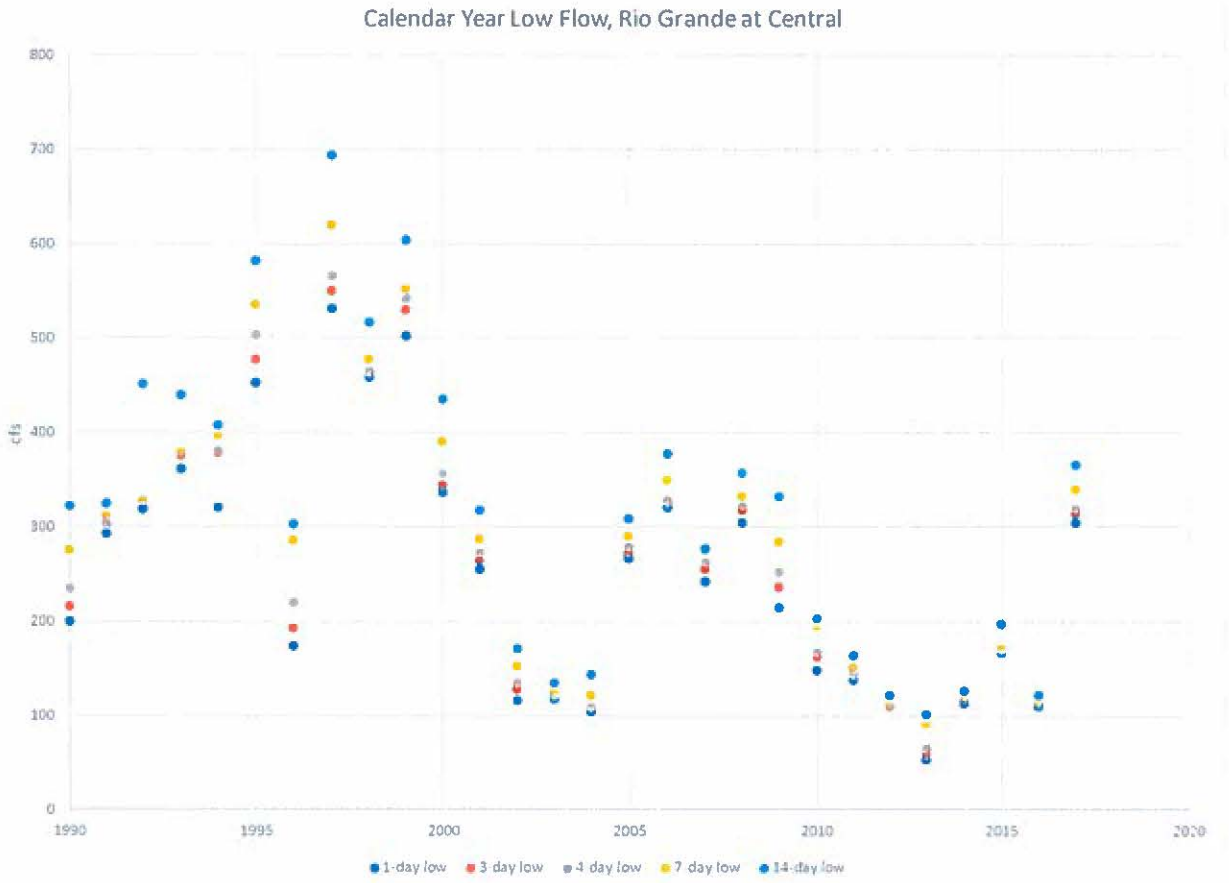


Figure 7: Frequency of Flow Rates, Rio Grande at Central, 1997-2017

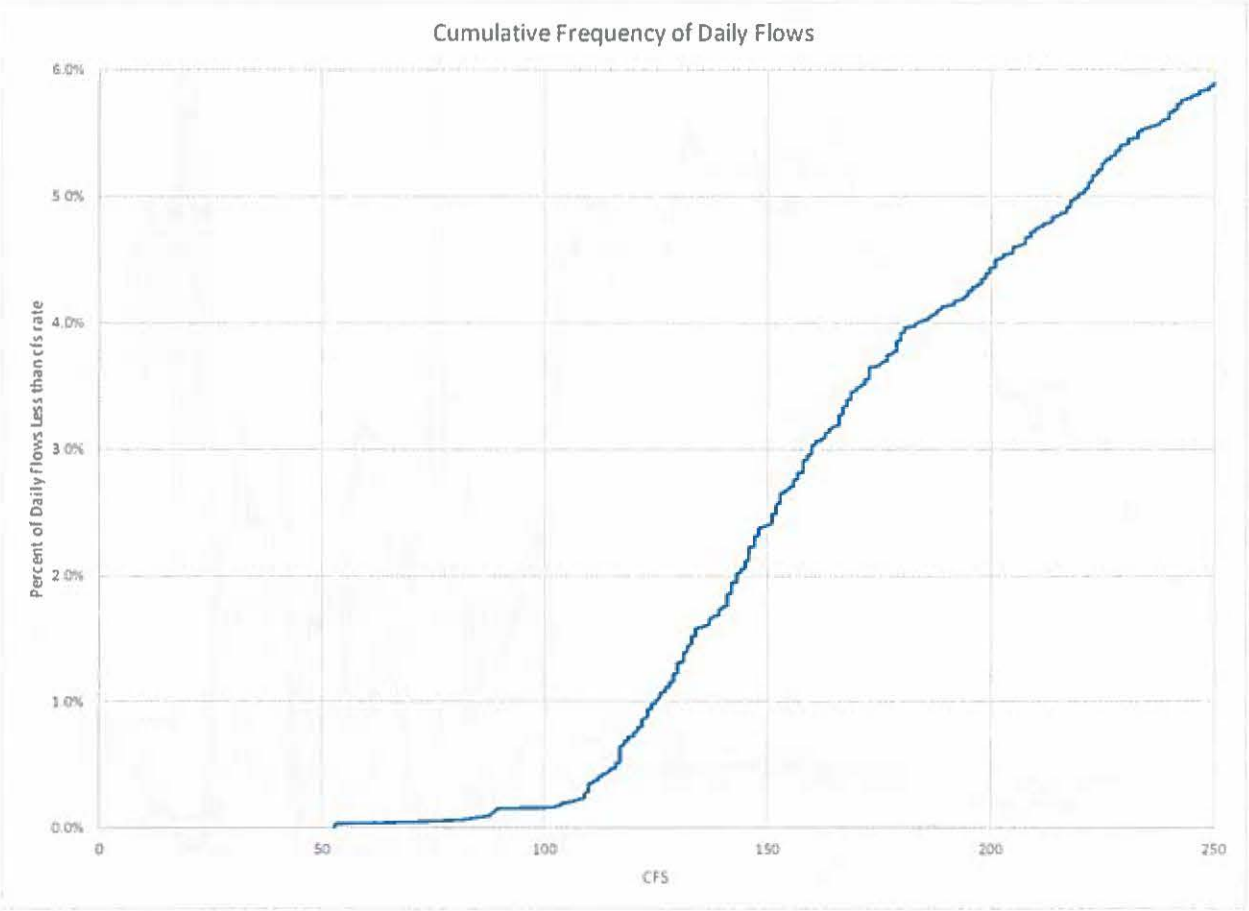


Figure 8: Rio Grande Flows and Diversions at Central and Upstream, 2013 (data from USGS and MRGCD/US Bureau of Reclamation)

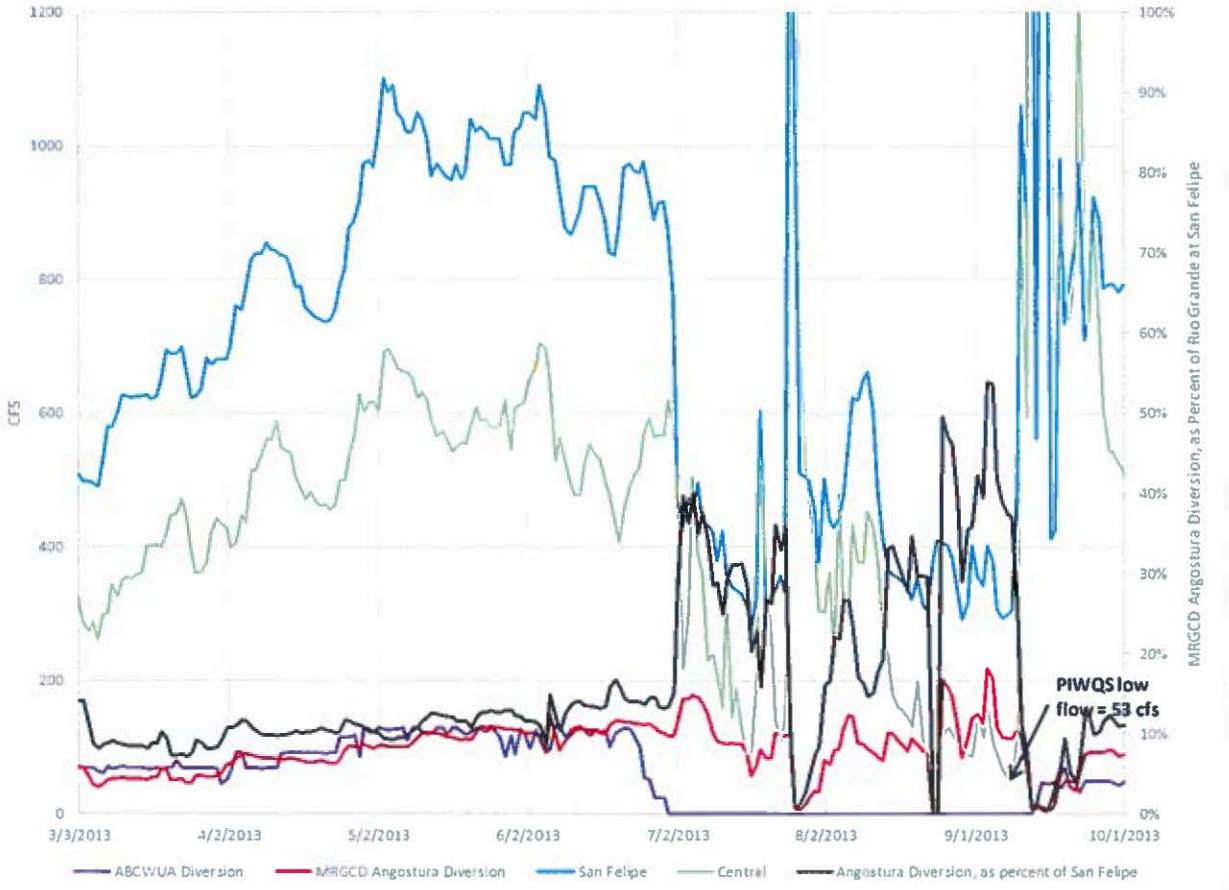


Figure 9: Releases of San Juan-Chama Water from Abiquiu, 2013 (data from Upper Rio Grande Water Operations Model (URGWOM)

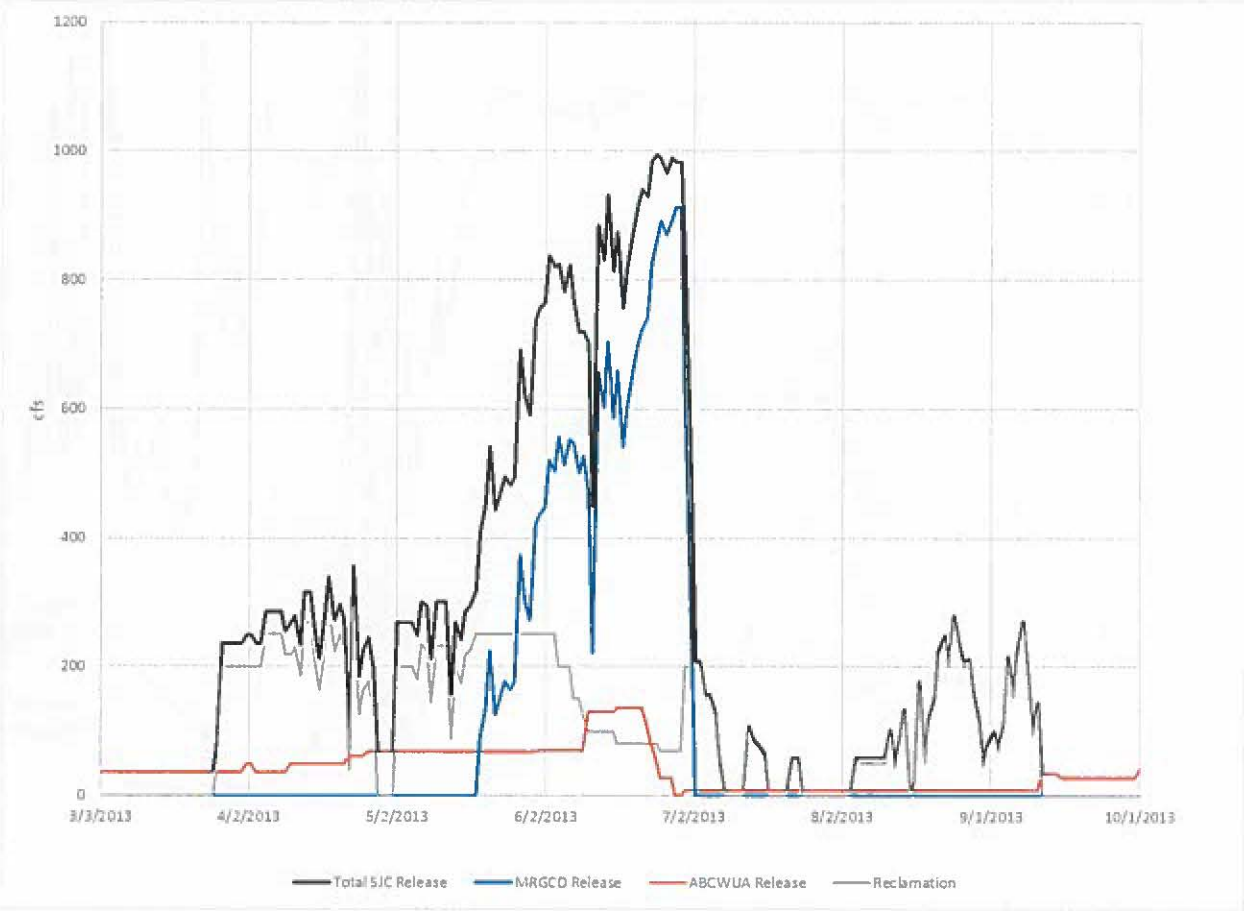
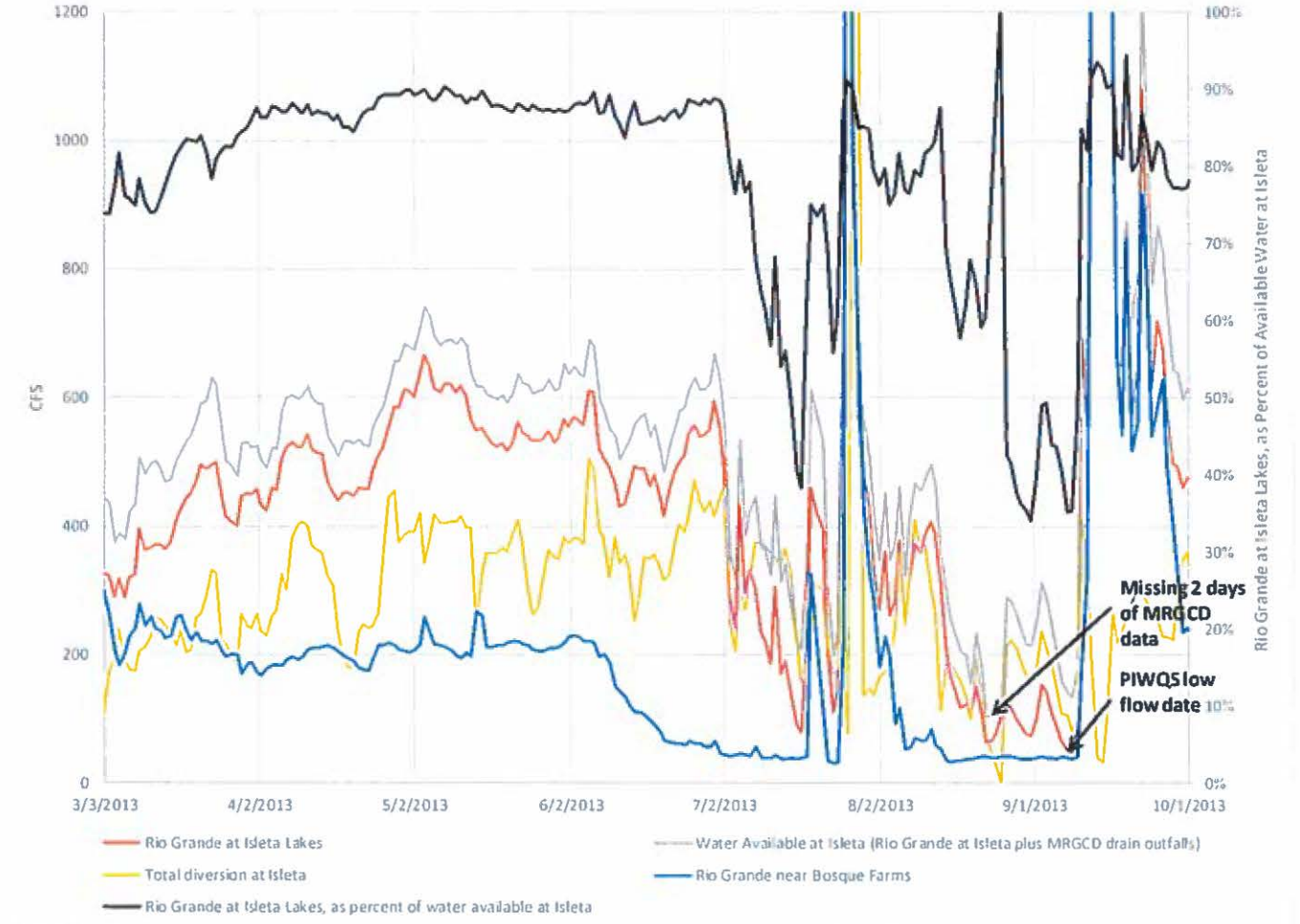


Figure 10: Rio Grande Flows and Diversions Below Central, 2013 (data from USGS and MRGCD/US Bureau of Reclamation)



JACOBS

Memorandum

Evaluation of 2018 Proposed SWRP NPDES Discharge Permit

Attachment 1

Excerpt from the 2015 Biological Opinion:

2.4.4.2.2 Angostura Diversion

MRGCD operation of Angostura Dam variably reduces flow below Angostura Dam by up to about 300 cfs. During spring runoff diversion of water by the MRGCD at Angostura Dam has an impact of reducing flows between 4% and 48%. During the summer/fall low-flow period, diversion of water by MRGCD at Angostura Dam is between 48% and 100%. During the winter months, when the MRGCD is not operating to divert water at Angostura Dam, there is no hydrologic impact from diversion operations.

The reductions in flow caused by Angostura diversion impact most of the Albuquerque Reach. Return flow may re-enter the river in a few places, but most return flow remains in canals and drains until just upstream of Isleta Diversion Dam. Adding the impact of Cochiti diversion (adjusted for return), the overall impact on the Albuquerque Reach during the spring runoff is to reduce flow between 4% and 43%. For the summer/fall low flow period, the overall impact of MRGCD diversions on the Albuquerque Reach is a potential maximum reduction of naturally occurring flows between 43% and 100%.

However, just as with Cochiti Reach, when natural flows are less than required for normal operation, MRGCD requests release of water stored in El Vado Reservoir, and contracted SJC Project water, to increase flows to the level required for diversion at Isleta Dam. This lessens or reverses the impact to Albuquerque Reach by increasing inflow above natural rates. The incidence of river drying in the Albuquerque Reach is thus moderated by the release of stored water.

2.4.4.2.3 Isleta

MRGCD operation of Isleta Dam variably reduces flow below Isleta Dam by up to about 800 cfs. During spring runoff diversion of water by the MRGCD at Isleta Dam has an impact of reducing flows between 12% and 100%. During the summer/fall low-flow period, diversion of water by MRGCD at Isleta Dam has an impact on flows below the dam up to 100% in most years. During the winter months, when the MRGCD is not operating to divert water at Isleta Dam, there is no hydrologic impact from diversion operations.

Adding the impact of Cochiti and Angostura diversions (adjusted for return) the overall impact on the Isleta Reach during the spring runoff is to reduce flow between 15% and 100%. The 100% impact (complete drying) occurs in about 16% of years. In 52% of all years, less than a 25% reduction in spring runoff occurs, demonstrating a general pattern of feast or famine for the MRG. For the summer/fall low flow period, the overall impact of MRGCD diversions on the Isleta Reach is 100% reduction in many (44%) years.

When requesting release of water from storage, MRGCD only releases up to the amount required to cause a desired quantity for diversion to arrive at Isleta Dam. As discussed above, this has an impact to Cochiti and Albuquerque Reaches of increasing flow and reducing drying; however, it has no impact on the incidence of drying in the upper 20 miles of the 53-mile Isleta Reach. Normal MRGCD operation changes the pattern of drying in the Isleta Reach, causing the lower 33 miles of the reach to remain wet. When MRGCD is not in

normal operation, the lower 33 miles may be expected to also dry in years (46%) in which natural MRG inflow drops below about 670 cfs.

The impact of Isleta Dam (including Cochiti and Angostura) on the summer/fall low-flow period with respect to drying is complex. In 40% of years natural inflow is not sufficient to reach Isleta Dam, and there is no impact on Isleta Reach (or the downstream reaches) due to operation of Isleta Dam. In 18% of years there are variable impacts on the Isleta Reach (drying between Isleta Dam and San Acacia Dam) due to the operation of Isleta Dam. In 34% of years, there are variable drying impacts on the San Acacia Reach due to the operation of Isleta Dam. In 4% of years, the operation of Isleta Dam has an impact on flows downstream of San Marcial. In the remaining 4% of years no drying occurs in the MRG as a result of Isleta Dam operation.